*animal*

# Determining the economic value of daily dry matter intake and associated methane emissions in dairy cattle

C.M. Richardson1, C.F. Baes1, P.R. Amer2, C. Quinton2, P. Martin1, V.R. Osborne1, J.E. Pryce3,4, and F. Miglior1,5

1*Center for Genetic Improvement of Livestock, Department of Animal Biosciences, University of Guelph, 50 Stone Road East, Guelph, ON, N1G 2W1 Canada*

2AbacusBio Limited, PO Box 5585, Dunedin, New Zealand

3*Agriculture Victoria, 5 Ring Road, Bundoora, Vic. 3086, Australia*

4*La Trobe University, AgriBio, 5 Ring Road, Bundoora, Vic. 3083, Australia*

*5Canadian Dairy Network, 660 Speedvale Avenue West, Guelph, ON, Canada N1K 1E5*

**Supplementary Material S1: regression coefficients**

*Calculating regression coefficients*

The regression of a profit trait, $B\_{LS.1}$, here the mean dry matter intake (DMI) of a 1st parity lactating heifer, on the mean DMI of each life stage of the animal can be described as a ratio of the covariance that exists between the mean DMI traits and the variance within the particular life stage trait.

$B\_{LS.1\*EBVFP } $= $\frac{cov(FP1, EBV\_{FP\\_LS })}{var(EBV\_{FP\\_LS })}$ [8]

This can further be deconstructed to show that the regression between the traits is dependent on the heritability and variance of each trait, as well as the genetic correlation between the traits.

 = $r\_{gFP\\_1, EBV\_{FP\\_LS }\*}\frac{\sqrt{h\_{FP\\_1}^{2}σ\_{pFP\\_1}^{2}}}{\sqrt{h\_{EBVFP\\_LS}^{2}σ\_{pEBVFP\\_LS}^{2}}}$ [9]

To account for a lack of information, assumptions based on previous work can be made. This allows the relationship between traits to be expressed as a ratio of deviations.

 Assumption 1: $r\_{gFP\\_1, EBV\_{FP\\_LS }}$ = 1

Assumption 2: $h\_{FP\\_1}^{2}= h\_{FP\\_LS}^{2}$ then,

 =$ \frac{\sqrt{σ\_{pFP\\_1}^{2}}}{\sqrt{σ\_{pEBVFP\\_LS}^{2}}}$ [10]

Assumption 3: Coefficient of Variance (CV) for FI trait generally 10-20%, and CVFP\_1 = CVEBVFP\_LS = 0.15

CV=$\frac{Phenotypic standard deviation}{mean }$ ; Standard deviation = CV\*mean

From [10] $B\_{FP\\_1} $\*EBVFP\_LS= $\frac{\sqrt{σ\_{pFP\\_1}^{2}}}{\sqrt{σ\_{pEBVFP\\_LS}^{2}}}$

 = $\frac{CV\_{FP\\_1}\*µ\_{FP\\_1}}{CV\_{EBVFP\\_LS\*}µ\_{EBVFP\\_LS}}$ [11]

 = $\frac{µ\_{FP\\_1}}{µ\_{EBVFP\\_LS}}$ [12]

Therefore, these assumptions allow the regressions to be expressed as a ratio of the means.